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Identifying investment pathways and business ecosystem synergies for H2MA territories

Activity 3.4

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Short description

H2MA brings together 11 partners from all 5 Interreg Alpine Space EU countries (SI, IT, DE, FR, AT), to coordinate and accelerate the transnational roll-out of green hydrogen (H2) infrastructure for transport and mobility in the Alpine region. Through the joint development of cooperation mechanisms, strategies, tools, and resources, H2MA will increase the capacities of territorial public authorities and stakeholders to overcome existing barriers and collaboratively plan and pilot test transalpine zero-emission H2 routes.

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EXECUTIVE SUMMARY

This deliverable presents the results of **Activity 3.4 of the H2MA project**, which focuses on identifying investment pathways and building business ecosystem synergies to accelerate the rollout of green hydrogen mobility in the Alpine region. The aim is to help businesses, regional authorities, and cross-border partnerships unlock financing opportunities and develop coordinated strategies for sustainable deployment.

Key findings show that hydrogen mobility in the Alpine region depends on four main conditions:

- **Governance and regulation**: Clear rules on tariffs, safety, and permitting, combined with EU–national harmonisation, are essential to attract investment.
- **Market development**: Commercial viability requires sufficient daily demand, achievable through early fleet commitments, multi-user hubs, and corridor-based planning.
- **Cross-sector synergies**: Integrating hydrogen with renewables, e-mobility, and logistics strengthens the business case and enables cost-efficient, corridor-focused deployment.
- **Social acceptance and skills**: Public trust and trained operators are as important as infrastructure, calling for awareness campaigns and targeted workforce programmes.

Pilot projects remain vital entry points but must quickly evolve into integrated ecosystems that connect production, refuelling, logistics, and industrial demand. Scaling these efforts depends on green financing instruments such as Horizon Europe, CEF, and InvestEU, alongside blended PPP models that can transform early demonstrations into bankable projects.

The national roadmaps highlight ongoing initiatives and practical next steps, with a strong emphasis on corridor-based cooperation, pooling of fleet demand, and mobilising green finance. Common recommendations point to the need for aligning regional and national strategies with EU priorities and TEN-T corridors, coordinating rollout through corridor-specific working groups, leveraging digital tools for refuelling and logistics optimisation, and pairing infrastructure deployment with awareness campaigns and modular workforce training.

The overall implication is clear: technological readiness is no longer the bottleneck. Progress now hinges on regulatory clarity, coordinated investment, and sustained public support. If stakeholders act jointly across borders and sectors, the Alpine regions can

position themselves as frontrunners in Europe's hydrogen transition and set replicable models for ecosystem-based deployment.

The annex provides templates for Memoranda of Understanding (MoU) and Memoranda of Cooperation (MoC), ensuring consistent documentation of commitments and supporting the long-term uptake of hydrogen mobility initiatives.

1. INTRODUCTION

The activity focuses on the organisation of matchmaking workshops involving key stakeholders: green hydrogen mobility infrastructure providers, renewable energy producers, and hydrogen sector businesses. Conducted by all project partners with the support of Local Working Group (LWG) members, these workshops are designed to stimulate the development of green hydrogen hubs—or "hydrogen valleys"—adapted to the specific needs and contexts of each partner territory.

The matchmaking workshops conducted under Activity 3.4 were conceived as an operational mechanism to:

- Facilitate structured dialogue and networking among key actors in the green hydrogen mobility value chain.
- Stimulate concrete collaborations leading to the creation of hydrogen hubs and cross-regional synergies.
- Promote the formalisation of stakeholder commitments through the signing of Memoranda of Cooperation (MoC) and Memoranda of Understanding (MoU). These agreements aim to secure stakeholder commitment for the uptake of project results and foster an enabling environment for the mobilisation of investments in hydrogen infrastructure and services.
- Identify practical opportunities and barriers relevant to each territory to inform future project activities.

The target groups invited to participate were those actors deemed essential for the successful deployment of hydrogen-based mobility solutions in the Alpine space, specifically:

- Renewable energy (RES) producers and energy utilities.
- Infrastructure providers and technology developers.
- Hydrogen businesses and operators active in the production, storage, and distribution of hydrogen.
- Local and regional authorities, including municipal and regional governments and planning agencies.
- Financial institutions and investors with potential to support infrastructure and mobility projects.
- Complementary stakeholders, such as research institutions, sectoral agencies, logistics operators, and public transport companies.

1.1 Purpose and scope of the deliverable

The deliverable provides and overview of the implementation of Activity 3.4 and documents the input and lessons learnt from the matchmaking workshops organised by the project partners. Drawing upon this input, complemented by additional desk research, the deliverable analyses the ways in which relevant businesses and ecosystems in the H2MA territories can harness green financing opportunities and build cross-sectoral synergies to support the rollout of hydrogen solutions in commercial and urban mobility.

Specifically, this deliverable aims to:

- Outline the goals, target groups, and intended outcomes of the matchmaking workshops.
- Describe the engagement methodologies employed by partners to bring together relevant stakeholders.
- Present the process and current status of the signing of MoCs and MoUs.
- Conduct a thematic analysis of partners' feedback pertaining to infrastructure and technology needs, financial barriers, promising business models, and collaboration opportunities.
- Develop roadmaps for each partnership area, integrating policy recommendations from workshop findings and research insights to guide investment and support hydrogen mobility at both local and transalpine levels.

2. MATCHMAKING WORKSHOPS

2.1 Overview of workshops conducted

As part of Activity 3.4, the project partners organised and participated in several matchmaking workshops and related events, each tailored to the specific needs and contexts of their territories. The key workshops included:

- **Italy (July 7, 2025, online seminar):** A members-only seminar on hydrogen mobility hosted by H2IT – Italian Hydrogen Association. Environment Park, on behalf of CMTO, engaged energy and gas utilities, oil companies, and a public transport company to discuss HRS deployment and hydrogen mobility initiatives.
- **Austria (April 29, 2025, in Gabersdorf, plus follow-up online workshops):** The main workshop was held at the renewable gas field in Gabersdorf as part of a larger event dedicated to hydrogen applications in heavy goods transport. In addition to that further online meetings have been carried out in cooperation with COD to train additional stakeholders.
  Participants included RES producers, infrastructure providers, research organisations, local authorities, financial institutions, enterprises, which are interested in investing in hydrogen infrastructure, energy agencies and members of the Austrian Hydrogen Valley.
- **Germany (May 28, 2025, H2 Expert Dialogue & Cross-border dialogue between Germany and Italy):** At the invitation of project partners KPO and ITALCAM, more than 30 stakeholders from Baden-Württemberg along the hydrogen value chain gathered in Freiburg, Germany, for the H2MA workshop at the premises of badenova, the largest regional energy supplier and network operator.
- **Italy – COD (May 29, 2025, online workshop):** A session targeting local authorities and financial institutions, focusing on investment opportunities and policy alignment for hydrogen projects.
- **France (June 12, 2025, Euro Supply Chain trade fair, Mulhouse):** PVF and EMS presented the H2MA mapping tool, followed by a B2B[1] workshop with logistics and transport operators, including Kleyling, Neotrucks, and TMFOP[2].
- **Slovenia (June 6, 2025, in-person event):** A workshop coordinated by KSSENA and BSC Kranj with local municipalities and sectoral agencies, focusing on the replication of H2MA tools and methods.
- **Lombardy, Italy (June 26, 2025, World Café workshop):** Hosted by Fondazione Lombardia per l'Ambiente and Regione Lombardia, this workshop gathered

[1] Business-to-business (B2B)
[2] https://tmfop.com/en/

academia, industry, technology providers, and policymakers to align local initiatives with regional and European hydrogen strategies.

2.2 Stakeholder engagement: groups and methods

The engagement strategy combined structured outreach and targeted networking to maximise stakeholder participation and relevance. Partners employed methods such as:

Direct invitations and stakeholder mapping: The partnets identified and contacted known actors in the hydrogen, renewable energy, and mobility sectors.

Collaboration with established networks and associations: The partners worked with groups such as H2IT, the Styrian Energy Agency, WIVA P&G, and the 3H2 cross-border network to ensure broad representation.

Use of institutional contacts and networks: Partners drew on their own connections and credibility as regional authorities and public agencies (e.g., Regione Lombardia, Fondazione Lombardia per l'Ambiente) to engage additional stakeholders who might not otherwise have participated.

Participation in sectoral events: The partners presented H2MA results and the mapping tool at the Euro Supply Chain trade fair in Mulhouse (12 June 2025), followed by a workshop to engage transport and logistics professionals not yet involved in the project.

Follow-up interviews and direct engagement: The partners conducted interviews and one-to-one exchanges to refine collected data and ensure that the feedback was relevant and actionable.

Digital communication: The partners kept stakeholders informed by sharing invitations, agendas, and updates through project websites, newsletters, and social media.

2.3 Process for signing of the Memoranda of Cooperation (MoC) and Memoranda of Understanding (MoU)

As part of Activity 3.4, the project partners launched a coordinated process to secure stakeholder commitment through the signing of Memoranda of Cooperation (MoC) and Memoranda of Understanding (MoU). This approach is designed to support the transnational roll-out of green hydrogen mobility infrastructure in the Alpine region, in line with the objectives of the H2MA project.

The process was structured as follows:

- Each project partner identified and mapped relevant stakeholders in their regions and areas of thematic focus, including energy producers, infrastructure providers, local and regional authorities, transport operators, investors, research organisations, and sectoral agencies.

- Direct invitations and targeted engagement activities were carried out, often building on contacts developed through the matchmaking workshops (see Section 2.3) and related networking events. Partners used tools such as bilateral meetings, phone interviews, thematic working groups, and participation in trade fairs and industry events to present the project objectives and explain the benefits of signing.
- Stakeholders were offered two types of memoranda, according to their potential role in the uptake of the project results:

Memoranda of Understanding (MoU): intended for stakeholders interested in supporting the transnational roll-out of green hydrogen mobility infrastructure in the Alpine region but who may not directly implement project solutions in their operations. The MoUs formalize a shared commitment to:

- Share knowledge, strategies, and tools.
- Promote cross-border cooperation and governance; Strengthen the capacity of public authorities and stakeholders.
- Encourage green investment and financing.
- Develop and pilot hydrogen mobility routes in the Alpine region.

Cooperation under the MoU may include participation in the Alpine Collaboration Framework, stakeholder engagement, joint planning of hydrogen corridors, pilot actions, and development of policy recommendations. The MoU is not legally binding and does not create financial or legal obligations.

Memoranda of Cooperation (MoC): The MoCs were designed for stakeholders ready to actively adopt and implement H2MA outputs and solutions. Their primary goal is to stimulate the emergence of green hydrogen hubs or "valleys" for mobility ecosystems in each partner's territory. The MoCs specify which H2MA outputs (e.g., the planning tool, masterplan, policy recommendations) are relevant, describe how these tools will be used in planning, investment, and operational decisions, and confirm willingness to participate in the Alpine Collaboration Framework. By formalizing this active engagement, the MoCs accelerate practical deployment of hydrogen mobility solutions, supporting regional roll-out while fostering transnational coordination across the Alpine Space.

3. KEY FINDINGS AND THEMATIC ANALYSIS OF PARTNER INPUT

Developing hydrogen infrastructure in the Alpine region requires a balance between general hub requirements and adaptations for geographically constrained areas. Matchmaking workshops (Activity 3.4) and partner input highlighted both cross-cutting success factors and the specific challenges of remote and mountainous contexts.

3.1 Critical parameters impacting the deployment of hydrogen mobility in the Alpine region

Hydrogen mobility deployment in the Alpine region must reconcile two contrasting realities: the dense traffic and logistics corridors that represent the most immediate market opportunities, and the remote, mountainous areas where infrastructure development faces significant economic, geographic, and social barriers. Stakeholder discussions across the H2MA workshops consistently highlighted that success depends not only on corridor-based investment but also on tailored, flexible solutions that can serve less accessible regions.

Strategic siting and routing of hubs

Hydrogen refuelling hubs are recognised as the backbone of the Alpine hydrogen mobility transition, but their viability is closely tied to geography and demand. Stakeholders consistently emphasised the importance of aligning hub placement with TEN-T transport corridors and logistics centres. These locations guarantee concentrated offtake, fulfil the mandatory coverage targets set by the EU's Alternative Fuels Infrastructure Regulation (AFIR), and connect to the European Hydrogen Backbone.

At the same time, participants expressed the view that hydrogen stations need not be located in the most remote Alpine valleys. Instead, situating hubs just north or south of the mountainous areas allows long-range hydrogen trucks to cross the Alps without requiring permanent infrastructure in environmentally sensitive high-altitude areas. The Euregio Tirol–Südtirol–Trentino pilot corridor (Brennerachse)[3] represents a leading example of this approach, anchoring a cross-border hydrogen corridor at strategic transit points rather than within fragile ecosystems.

Integration with renewables and existing assets

Infrastructure deployment is strengthened when linked to local renewable energy production or existing industrial and grid assets. By minimising transport distances, such integration reduces costs and enhances sustainability. Best practice examples include:

[3] https://landesregierung.provinz.bz.it/de/news/brennerachse-als-wasserstoff-pilotkorridor-absichtserklarung

- Styrian Hydrogen Route (Austria): Repurposing existing gas pipelines for hydrogen distribution, reducing CAPEX and accelerating deployment.
- SEA's Hydrogen from Sludge (Lombardy): Converting wastewater treatment facilities into decentralised hydrogen production sites, illustrating circular economy integration[4].
- In Baden-Württemberg, pipeline initiatives illustrate both progress and persistent gaps in connectivity. The H2@Hochrhein project is set to link the region between Grenzach-Whylen and Waldshut-Tiengen along the Swiss border, while the RHYn-Interco project will connect Freiburg to the French RHYn system. Together, these cross-border initiatives demonstrate how infrastructure development can advance regional integration, yet they also highlight that further effort is needed to ensure full alignment with Alpine mobility corridors.

Decentralised renewable production (e.g., from hydro, PV, or wind) can provide local energy autonomy in isolated communities. However, stakeholders noted varying acceptance levels of wind and solar projects, especially in scenic or protected areas.

Flexible and modular deployment models

Remote Alpine areas are unlikely to justify large-scale, permanent infrastructure in the short term. To address this, stakeholders proposed a range of modular and transportable solutions, including:

- Mobile refuelling units that can be deployed seasonally or temporarily without major fixed investments.
- Small-scale electrolysers co-located with renewables, providing decentralised production for local demand.
- Hybrid systems that combine electrolysers with battery storage to stabilise weak-grid regions and ensure continuous operation.

Such approaches allow even low-demand areas to integrate hydrogen without the need for full-scale networks. They also provide stepping stones toward future expansion if offtake increases.

Securing demand and ensuring value chain readiness

Hydrogen hubs require a minimum demand to operate viably. Estimates from Italy suggest that around 400–500 kg/day is necessary to ensure commercial sustainability. To reach this threshold, early-stage projects depend on committed customers—particularly logistics operators, fleet users, and corridor traffic.

[4] https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101155866.pdf

Smaller markets, such as Slovenia, illustrate the difficulties of scaling without national coordination and sufficient demand aggregation. While the NAHV project marks a significant milestone as Slovenia's first hydrogen valley, limited offtake in mountainous territories underscores the importance of coordinated strategies at the national and regional levels.

Governance, social acceptance, and community involvement

Infrastructure roll-out must be accompanied by robust governance frameworks and stakeholder engagement. Several workshop participants stressed that even technically sound projects can fail if they lack local legitimacy. BSC Kranj mentioned a case involved a proposed project to deploy hydrogen-powered snowcats in a ski resort, which was rejected due to community resistance and environmental concerns. This example highlights the necessity of:

- Early dialogue with residents,
- Transparent communication of benefits and risks, and
- Sensitivity to environmental and cultural values of Alpine landscapes.

Cross-border integration and interconnectivity

Hydrogen mobility in the Alpine region is inherently transnational. Trucks and freight corridors traverse multiple jurisdictions, making cross-border interoperability a precondition for success. Current weaknesses—such as limited connectivity between Slovenia and neighbouring countries—risk creating bottlenecks in otherwise viable corridors.

Stakeholders therefore emphasised the need for:

- Cross-border pilot corridors (e.g., Brennerachse) that serve as anchors,
- Stronger policy alignment between national hydrogen strategies, and
- Digital management platforms for demand forecasting, route optimisation, and balancing decentralised energy systems.

Capacity, innovation, and skills

Finally, long-term viability depends on scalability and skills development. Hydrogen hubs must be designed for modular expansion, incorporating digital systems for balancing supply and demand, and ensuring economic resilience through diversified revenue streams. At the same time, local capacity building—through workforce training, safety protocols, and research-driven pilot projects—is essential to reduce reliance on external technical expertise.

3.2 Financing and business models for hydrogen mobility

Hydrogen mobility in the Alpine region faces both financial and operational challenges, which require integrated approaches that combine funding mechanisms, demand-side incentives, and innovative business models. Workshop discussions consistently underlined that the long-term viability of hydrogen hubs depends on coupling infrastructure development with sustainable financing structures and coordinated cross-sectoral deployment.

Key financial barriers and uncertainties

Despite growing political commitment, several structural obstacles slow down investment in hydrogen mobility:

- **High capital expenditure (CAPEX):** Electrolysers, refuelling stations, and fuel-cell vehicles remain capital intensive. Hydrogen trucks can exceed €600,000 per unit, while stations cost €2–5 million each. Renewable electricity costs further elevate RFNBO production prices.
- **High hydrogen fuel costs:** Current green hydrogen ranges €8–20/kg, far above diesel or electricity alternatives.
- **Limited demand-side incentives:** Existing subsidies mainly target production infrastructure, leaving vehicle operators without strong purchase or usage benefits.
- **Regulatory and market uncertainty:** Pending tariffs (e.g., Italy's *decreto tariffe*), fragmented strategies (e.g., Slovenia), or station closures (Austria) undermine investor confidence.
- **Barriers for SMEs and municipalities:** Many smaller actors lack access to financing due to co-funding requirements or insufficient collateral.
- **Fragmented value chains:** Weak integration between production, distribution, and consumption increases risk, particularly in low-demand Alpine sub-regions.

Funding schemes and regional experiences

Workshop inputs highlighted a patchwork of funding schemes across Alpine countries, with varying degrees of success:

- **Italy:** NRRF, Horizon Europe, and CEF provide support for hydrogen refuelling stations (HRS) and some RFNBO production, but limited incentives exist for vehicles. Administrative complexity restricts uptake.
- **Austria:** National programs (EBIN, ENIN) subsidise vehicles and stations; Ökofonds provides application support. However, the future pipeline of funding remains uncertain.

- **Germany:** The National Hydrogen Strategy supports pilots and infrastructure via schemes such as ELY, LWT, and KWH2. The most important one is the German Hydrogen Core Grid where more than 9000 km of H2-pipelines are planned.[5] Competition for funds and heavy bureaucracy slow progress.
- **Slovenia:** Financing instruments (Loan 77PP024, Borzen FITs, EV/FCEV subsidies) exist, but low co-financing rates and lack of strategy limit effectiveness.
- **France (Grand Est):** Regional calls such as *Écosystèmes territoriaux hydrogène*, RHYn, and HYfen are active, but outcomes remain uncertain, reducing investor confidence.
- **Lombardy / Veneto:** Programmes such as PNRR Green Hydrogen Valleys and H2iseO support production and hubs, but SMEs struggle to meet co-financing thresholds.

Taken together, these examples show that while public funding is available, it remains fragmented, administratively complex, and insufficiently demand-focused.

Incentives and innovative financing opportunities

To unlock scalable deployment, stakeholders emphasised the need for balanced, demand-focused instruments:

- **Demand-side incentives:** Vehicle purchase subsidies, usage-based grants, reduced tolls, or privileged access rights for H_2 fleets.
- **CAPEX grants and blended finance:** 30–50% public co-funding for infrastructure, combined with concessional loans and equity.
- **Risk mitigation tools:** Loan guarantees, first-loss facilities, and Contracts for Difference (CfDs) to stabilise hydrogen prices and revenues.
- **Green financing instruments:** Hydrogen Hub Funds pooling EU, national, and private capital; issuance of green bonds and sustainability-linked loans for corridor projects.
- **Market-based incentives:** Carbon pricing, tradable credits, or vouchers tied to verified hydrogen use.
- **Project preparation support:** Funding for feasibility studies, permitting, and consortium-building, particularly for smaller municipalities and SMEs.

[5] https://www.bundesnetzagentur.de/DE/Fachthemen/ElektrizitaetundGas/Wasserstoff/Kernnetz/start.html

Emerging business models and cross-sector integration

Stakeholders identified several promising business models that reduce risk and improve utilisation:

Fleet-based captive use: Public bus operators, waste collection services, and logistics companies provide predictable fuel demand to support station economics.

Hydrogen-as-a-Service (H2aaS): Bundled leasing contracts for vehicles, fuel, and maintenance lower upfront barriers for operators.

Shared multi-user hubs: Stations co-located with freight villages, airports, or industrial zones ensure high utilisation rates.

Mobility-as-a-Service (MaaS): Centralised hydrogen-powered shared mobility fleets in urban contexts.

Public–private partnerships (PPPs): Municipal and corridor-based concessions distribute investment risk across public and private actors.

Producer–consumer integration: Vertical integration, where hydrogen producers also operate vehicles and refuelling stations, secures offtake, and reduces volatility.

Integration across sectors further strengthens these models:

- **Energy-transport consortia** combining utilities, infrastructure operators, and logistics firms.
- **Corridor-based cooperation** for cross-border station deployment.
- **Industrial symbiosis**, such as using waste-to-hydrogen for mobility.
- **Cross-sector platforms** (e.g. H2MA, LE2C) to coordinate planning, align regulation, and pool funding.

Pilot projects and scaling pathways

Several initiatives across the Alpine region show how integrated business and financing models for hydrogen mobility can be both viable and replicable:

- **France–Italy (Fréjus corridor):** Piedmont Region and Région Auvergne–Rhône-Alpes are coordinating hydrogen truck adoption along the Lyon–Turin–Milan/Genoa axis. This includes harmonised HRS deployment, cooperation with motorway concessionaires, and reduced tolls for H_2 vehicles in line with the Eurovignette directive—an approach under discussion also for the Mont Blanc tunnel.

- **Italy (Lombardy & Veneto):** Initiatives like Edison's projects[6] combining hydrogen for ceramic kilns and mobility, the SEA sludge-to-H_2 initiative[7], and the *H2Veneto* cluster[8] (30+ members across utilities, SMEs, universities) demonstrate how industrial and mobility demand can be coupled. Structured working groups, joint calls, and Memoranda of Cooperation ensure risk-sharing, clear commitments, and workforce training.
- **Slovenia (North Adriatic Hydrogen Valley):** The NAHV project represents Slovenia's first hydrogen valley, building local production linked to mobility, with cross-sector partnerships between municipalities, industry, and research institutes. While demand aggregation remains challenging, the project highlights the importance of linking mobility to broader industrial use.
- **Germany (Freiburg, Baden-Württemberg):** ASF's "Emission-Free Waste Collection" project[9] integrates solar-powered electrolysis, municipal hydrogen fleets, and on-site refuelling, creating a vertically integrated model where surplus hydrogen is sold to third parties—demonstrating how local utilities can anchor hydrogen ecosystems.
- **Austria:** Current pilots pair hydrogen vehicles with company-owned refuelling stations along fixed logistics routes[10]. While this limits flexibility, it ensures control and bankability, helping SMEs transition before large-scale corridor infrastructure is in place.

These examples reveal common scaling pathways: multi-user hubs that aggregate demand, integration with industrial consumption, public–private partnerships that de-risk investment, and service-based models that reduce entry barriers for fleets. Together, they show that hydrogen mobility becomes commercially viable when embedded in broader regional ecosystems rather than pursued as stand-alone infrastructure.

3.3 Transnational cooperation, ecosystem-building, and synergies

Hydrogen mobility in the Alpine region cannot succeed through isolated projects. The technological, financial, and geographic complexities of deploying hydrogen infrastructure across multiple countries, high-altitude corridors, and low-demand areas demand strong collaboration between regions, sectors, and stakeholders. Ecosystem-building has therefore emerged as a cornerstone of current strategies: it ensures that investments are aligned, infrastructure is interoperable, and demand is aggregated across national borders.

[6] https://www.edison.it/en/edison-next
[7] https://ec.europa.eu/assets/cinea/project_fiches/innovation_fund/101155866.pdf
[8] https://www.smpetroli.it/en/blog-en/h2-lagoon-project-moving-towards-a-sustainable-future-in-green-hydrogen-in-veneto/
[9] https://greencity.freiburg.de/pb/1594669.html
[10] https://www.mobilityplaza.org/news/42430

Lessons from renewable energy and e-mobility further highlight how shared platforms, coordinated planning, and innovative partnerships can accelerate adoption while avoiding duplication of effort.

Cross-border and cross-sector cooperation

At present, much of the Alpine hydrogen rollout is concentrated along TEN-T corridors where cross-border continuity is critical. Stakeholders emphasise that without international coordination, fragmented infrastructure will reduce reliability for fleet operators and undermine investment confidence. Early cooperation is already visible through initiatives such as the 3H2 Trinational Hydrogen Initiative (France, Germany, Switzerland) and hydrogen corridors along the Brenner/A13 route (Italy–Austria–Germany). These projects demonstrate how countries can pool resources to align deployment timelines, harmonise standards, and reduce inefficiencies.

Practical measures currently under development include:

- **Digital interoperability**, such as real-time tools for refuelling availability, station booking, and predictive maintenance.
- **Common certification and labelling schemes**, ensuring carbon intensity and RFNBO compliance are recognised across borders.
- **Harmonised payment systems and loyalty programmes**, particularly relevant for freight companies operating transnational routes.
- **Standardised service protocols and safety rules**, lowering operational barriers for vehicle operators.
- **Joint communication and awareness campaigns**, targeting logistics operators and public fleets to stimulate demand.

Stakeholders argue that these forms of coordination must go further to prevent duplication of infrastructure and ensure public–private investments are pooled effectively. In practice, this requires continuous dialogue between a diverse set of actors:

- **Public authorities and regulators**, such as Regione Lombardia or municipal utilities (e.g. A2A, Hera Group), which bridge the gap between national hydrogen strategies and local implementation.
- **Energy providers and hydrogen producers**, including Snam, Italgas, Wien Energie, and Verbund, which lead in infrastructure deployment and innovation such as circular hydrogen production.
- **Transport and logistics operators**, from public fleets (ASF Freiburg, Trenord, ACTV) to freight and port operators (Spedition Bäumle GmbH, August Gschwander

Transport GmbH, Venice and Verona logistics hubs), who provide the critical demand base.

- **Research and innovation institutions**, including TU Wien, Università di Brescia, Fraunhofer ISE, and HyCenta, which deliver technical expertise, prototypes, and workforce training.
- **Platforms, clusters, and financial institutions**, such as LE2C in Lombardy, HyPA and WIVA P&G in Austria, and financial intermediaries like Finlombarda, which coordinate partnerships and enable access to funding.

This cross-sectoral involvement ensures that hydrogen deployment is not seen as a narrow transport initiative but as a systemic transformation spanning energy, logistics, and territorial planning.

Platforms, networks, and knowledge-sharing mechanisms

Collaboration in the Alpine hydrogen ecosystem is increasingly organised through formal networks and platforms, which provide institutional capacity, align strategies, and facilitate financing.

The Trinational Hydrogen Initiative ($3H_2$)[11] already connects nearly 80 partners across France, Switzerland, and Germany, coordinating corridor deployment, cross-border standards, and research activities. At the national and regional level, clusters such as WIVA P&G (Austria), HyPA, and LE2C (Lombardy) create structured channels for cooperation between industry, research, and government actors.

EU-funded programmes such as Interreg and the Connecting Europe Facility (CEF) also play a central role in building transnational alignment, while providing critical funding streams. These frameworks not only facilitate infrastructure investment but also enable knowledge exchange, joint pilot projects, and shared digital tools.

However, stakeholders underline that further consolidation is needed: a centralised Alpine coordination platform could streamline activities, reduce overlap, and ensure legal and technical frameworks remain interoperable. Shared digital services for end users—covering refuelling logistics, emissions tracking, and route optimisation—are seen as vital enablers of adoption.

Insights from adjacent sectors: renewable energy and e-mobility

Hydrogen mobility does not develop in isolation. The Alpine region already has extensive experience with renewable energy integration and electric mobility, which provides a strong knowledge base for planning, financing, and digitalisation. These sectors demonstrate how

[11] https://3h2.info/en/

large-scale infrastructure transitions can be achieved, offering practical lessons that can be adapted to hydrogen deployment.

Several transferable opportunities are emerging:

- **Infrastructure co-development**: Spatial planning methodologies and GIS-based siting tools from EV charging networks are now applied to optimise hydrogen refuelling station (HRS) deployment. Co-location with renewable energy plants or multimodal logistics hubs further enhances cost-efficiency.
- **Smart grid integration**: Techniques from e-mobility, including dynamic pricing, load management, and smart station management, can be adapted to hydrogen. These enable electrolysers to run more flexibly in response to variable renewable supply.
- **Financing models**: Proven structures from renewable energy, such as public–private partnerships and co-financing schemes, are being replicated for hydrogen fleets and refuelling networks. The ASF Freiburg "Emission-Free Waste Collection" project illustrates this approach, combining solar-powered electrolysis with hydrogen trucks and on-site refuelling.
- **Cross-border collaboration frameworks**: Lessons from EV corridors and joint mobility platforms provide models for harmonisation of standards, interoperability, and user services in hydrogen corridors.

At the same time, important differences must be acknowledged. Hydrogen deployment is more capital- and logistics-intensive than electricity, requiring local production, storage, and distribution infrastructure. Electrolysers depend on stable load profiles, while renewable generation is variable—often necessitating hybridisation with batteries or thermal storage. Regulatory frameworks also impose constraints: in Italy, for instance, Power Purchase Agreements (PPAs) and RFNBO rules set strict geographic and temporal conditions on renewable-electricity-to-hydrogen conversion, limiting cost optimisation.

Finally, demand dynamics diverge. Whereas e-mobility is largely consumer-driven, early hydrogen adoption in the Alpine region is fleet-based, centred on logistics, public transport, and captive-use applications. This shift requires aggregated demand models, tailored financial instruments, and multi-user hubs to ensure viability and risk-sharing.

4. LESSONS LEARNT AND STRATEGIC INSIGHTS

This chapter synthesizes insights gathered through stakeholder consultations, matchmaking workshops, pilot projects, and regional analyses across the H2MA partnership areas. The aim is to identify practical lessons, transferable strategies from adjacent sectors, and recommendations to guide local, regional, and national authorities in accelerating the deployment of hydrogen mobility ecosystems in the Alpine region. The lessons are presented in thematic clusters to provide a coherent narrative linking governance, market dynamics, cross-sector synergies, social engagement, and strategic planning.

4.1 Governance and regulatory frameworks

Effective governance and regulatory clarity have emerged as essential foundations for hydrogen mobility deployment. Across the Alpine region, stakeholders repeatedly highlighted that even technically mature solutions require clear rules, streamlined procedures, and coordinated policies to succeed.

- **Early and continuous engagement of authorities:** Engaging policy authorities and municipalities from the very beginning is critical. In Slovenia, stakeholders emphasized that early involvement of local authorities is necessary but must go hand in hand with concrete funding commitments and actionable plans. Similarly, in Lombardy, integrating municipalities into the planning of hydrogen refuelling stations-built trust and eliminate opposition, enabling smoother project rollouts and more community support.
- **Regulatory certainty for private investment**: Investors need predictability on multiple fronts, including tariffs, hydrogen purity standards, permitting processes, and station safety norms. In Baden-Württemberg, experts highlighted the urgent need to harmonize rules at both EU and national levels to provide this certainty. In Italy, delays in the “decreto tariffe” have left several promising projects in limbo, demonstrating the tangible impact of regulatory uncertainty on deployment timelines.
- **Cross-border alignment**: Harmonizing regulations along key corridors, particularly the TEN-T network, is essential to prevent fragmented infrastructure deployment. Without such alignment, fleet operators face operational discontinuities when traversing multiple countries, which can undermine confidence and investment in cross-border hydrogen mobility solutions.
- **Public-private partnerships and blended finance**: Shared investment models have proven effective in mitigating risk. Public-private partnerships (PPPs) and blended financing structures, including subsidies and guaranteed offtake agreements, help accelerate infrastructure rollout while lowering financial exposure for individual

stakeholders. Municipalities, while often eager to participate, require clear guidance to avoid fragmented or duplicated initiatives.

Key insight: Governance frameworks are the bridge between strategic ambition and practical implementation. By combining clear regulations, coordinated planning, and risk-sharing financial models, stakeholders can ensure that hydrogen mobility projects are both technically feasible and financially viable.

4.2 Market development and demand aggregation

Hydrogen hubs are commercially viable only when anchored by sufficient and predictable demand. Across the Alpine region, stakeholders repeatedly highlighted that securing early customers is essential to offset high capital costs and ensure long-term sustainability.

- **Minimum demand thresholds**: Estimates from Italy suggest that approximately 400–500 kg/day is necessary for a hydrogen hub to operate viably. Early adopters—such as logistics operators, public fleets, and freight traffic along key corridors—are therefore indispensable in the initial deployment phase. Without aggregated demand, stations face underutilisation, fragmented usage patterns, and an increased risk of financial underperformance.
- **Pilot projects as risk-mitigation tools**: Smaller-scale pilots provide controlled environments to test technologies, refine procedures, and validate business cases. In Lombardy and Baden-Württemberg, fleet-based pilots allowed operators to:
    - Assess vehicle and refuelling performance.
    - Optimize operational procedures.
    - Demonstrate commercial viability to investors.

  These pilots reduce risk perception and build confidence among stakeholders that hydrogen is a credible fuel alternative.

- **Cross-border and corridor-focused coordination**: Coordinating station placement along transnational routes—such as the Brenner or Lyon–Turin corridors—prevents isolated “islands” of hydrogen infrastructure and ensures continuity for fleet operators across borders. Multi-user hubs, co-located with industrial or logistics clusters, aggregate demand, enabling cost-sharing, higher utilization rates, and stronger economic viability.

Key insight: Early engagement of fleet operators, demand aggregation through multi-user hubs, and corridor-based coordination are critical to ensuring the economic sustainability of hydrogen infrastructure.

4.3 Cross-sector and cross-border synergies

Hydrogen mobility does not operate in isolation; it benefits from the lessons and infrastructure of adjacent sectors such as renewable energy and e-mobility. In the Alpine region, experience with electric vehicle (EV) networks and renewable energy integration provides transferable knowledge for siting, financing, digitalization, and operational management.

Several synergistic opportunities are emerging:

- **Infrastructure co-development:** Spatial planning and GIS-based siting tools, originally developed for EV charging networks, now inform optimal placement of hydrogen refuelling stations. Co-locating HRS with renewable energy plants or multimodal logistics hubs further enhances efficiency and reduces capital costs.
- **Smart grid integration:** Techniques from e-mobility, including dynamic pricing, load management, and predictive station management, can be adapted for hydrogen. Flexible electrolyser operation in response to variable renewable supply enhances both grid stability and operational efficiency.
- **Financing models:** Proven funding structures from renewable energy, such as public–private partnerships, co-financing schemes, and guaranteed offtake agreements, are being replicated in hydrogen mobility projects. For example, the ASF Freiburg "Emission-Free Waste Collection" project combines solar-powered electrolysis with hydrogen-powered trucks and on-site refuelling, demonstrating vertical integration and financial feasibility.
- **Cross-border collaboration frameworks:** Lessons from EV corridors and shared mobility platforms provide templates for harmonising standards, interoperability, and user services across borders, a necessity for TEN-T corridor operations.

However, hydrogen deployment also presents distinct challenges. It is more capital- and logistics-intensive than electricity, requiring local production, storage, and distribution infrastructure. Electrolysers need stable load profiles, while renewable energy generation is inherently variable, often necessitating hybridisation with batteries or thermal storage. Regulatory frameworks, such as Italy's Power Purchase Agreements (PPAs) and RFNBO rules, impose geographic and temporal constraints that can restrict cost optimisation. Finally, demand patterns differ whereas e-mobility initially targeted private consumers, early hydrogen adoption is fleet-focused, emphasizing aggregated demand models, multi-user hubs, and tailored financial instruments.

Key insight: Using experience from adjacent sectors accelerates deployment and reduces risk, but hydrogen's unique operational and regulatory challenges require customised approaches.

4.4 Social acceptance and workforce development

Technical and financial readiness alone do not guarantee hydrogen adoption. Across the Alpine region, stakeholders consistently emphasized that public trust, community acceptance, and a skilled workforce are critical for successful deployment.

- **Building public confidence through visible deployment:** Early exposure to hydrogen technology reduces uncertainty and scepticism. Practical demonstrations—such as pilot fleets, municipal buses, and initial logistics vehicles—allow communities to see hydrogen in action. Awareness campaigns should highlight:
  - Environmental benefits, including emission reductions.
  - Health improvements, such as cleaner air.
  - Economic opportunities and local job creation.
- **Workforce development as an enabler**: A competent workforce is essential for safe and efficient operation of hydrogen infrastructure. Initiatives across the region include:
  - University and vocational programs in Lombardy and Baden-Württemberg training technicians on hydrogen systems.
  - Upskilling initiatives in Slovenia focused on safe operation and maintenance of local infrastructure.
- **Aligning engagement with tangible benefits:** Social acceptance strengthens when communities directly perceive advantages, such as:
  - New employment opportunities
  - Industrial competitiveness
  - Improved air quality

Key insight: Integrating social engagement with visible deployment and targeted workforce training creates the foundation for sustained hydrogen mobility adoption, complementing technical and financial measures.

4.5 Strategic observations for roadmap design

Integrating the lessons above leads to several strategic insights for designing effective roadmaps for hydrogen mobility:

- **Move from pilots to ecosystems:** Hydrogen should evolve from isolated demonstration projects into integrated systems linking production, distribution, mobility hubs, and industrial demand. Ecosystem thinking ensures that investments, operations, and policies reinforce each other.

- **Ensure regulatory clarity:** Ambiguity around tariffs, safety, and permitting slows progress. Fast-tracking clear rules at local, national, and EU levels is critical to translating ambition into implementation.
- **Prioritize public-private collaboration:** Blended finance, PPPs, and guaranteed offtake agreements reduce financial risk and accelerate infrastructure deployment.
- **Plan cross-border and cross-sectoral:** Joint planning along Alpine corridors, exploring synergies with renewable energy and e-mobility, maximizes efficiency, scale, and climate impact.
- **Focus on social license and skills:** Awareness campaigns, municipal engagement, and workforce training are as vital as physical infrastructure.
- **Tailor approaches regionally:** Different Alpine contexts—industrial clusters, remote mountainous areas, and varying regulatory environments—require customised strategies while ensuring interoperability across borders.

Key insight: A successful roadmap must combine technical, financial, social, regulatory, and cross-border dimensions into an integrated strategy that fosters sustainable, scalable hydrogen ecosystems.

5. ROADMAPS FOR HYDROGEN MOBILITY IN THE ALPINE REGION

The following roadmaps synthesise lessons from stakeholder workshops, pilot projects, and regional analyses to provide a practical guide for accelerating hydrogen mobility across the Alpine space. Each section combines status, ongoing activities, and recommended operational measures, linking them to relevant actors in the ecosystem. While contexts differ across countries, all roadmaps emphasise phased deployment, integration with existing energy and transport systems, and capitalisation on green financing opportunities.

5.1 Slovenia (PP1: KSSENA, PP2: BSC Kranj)

Slovenia presents a unique mix of high political ambition and limited domestic implementation. While the country has articulated strong hydrogen targets, practical deployment remains in its infancy. The North Adriatic Hydrogen Valley (NAHV) stands as a key pilot initiative, providing early demonstrations in logistics and mobility. Yet, limited infrastructure in mountainous areas and weak integration along the hydrogen value chain have constrained both investor confidence and public awareness. Without a dedicated national hydrogen mobility strategy, access to funding remains fragmented, and scaling beyond pilot projects is challenging.

Building on these initial efforts, the roadmap proposes a phased approach. In the **short** term (2025–2027), pilot projects in logistics and public transport will be crucial. These pilots should use EU and regional funding while establishing a stakeholder working group to coordinate advocacy, align with AFIR requirements, and strengthen cross-border linkages with Austria and Italy. By connecting early projects to emerging corridors, Slovenia can anchor demand and demonstrate operational feasibility.

Over the **medium** term (2027–2030), these pilots should evolve into regional hydrogen hubs, co-located with renewable generation such as hydro or photovoltaic plants. Securing financing from Horizon Europe, CEF, and InvestEU, potentially through blended PPP models, will reduce risk and enable wider uptake. Aggregating demand across fleets and public transport operators will further enhance commercial viability and support the creation of a stable hydrogen ecosystem.

Looking toward the **long** term (2030+), Slovenia aims to embed hydrogen mobility within its national energy and transport strategy while developing cross-Alpine refuelling capacity linked to TEN-T corridors. Achieving this will require continued investment in regulatory clarity, workforce skills, and stakeholder engagement, ensuring that the country can move beyond isolated pilots to a fully operational hydrogen mobility network.

The **roadmap outlook** highlights that Slovenia's success will depend on moving quickly from small-scale pilots to operational corridors, supported by early green financing and

strong cross-border cooperation. Demonstration projects that work in practice will be crucial to inspire both public trust and investor confidence.

To accelerate this transition, Slovenian actors in the hydrogen value chain can play an active role in shaping regional momentum:

- By joining or initiating cross-border working groups with Austria and Italy, to ensure that pilot projects are connected to emerging TEN-T corridors and not developed in isolation.
- At the same time, working together to create demand from logistics operators, bus companies, and other fleets can strengthen the business case for the first refuelling stations, making financing more attractive and laying the groundwork for a scalable hydrogen mobility ecosystem.

5.2 France (PP3: Eurometropole de Strasbourg, PP5: Pôle Véhicule du Futur)

In France's Grand Est region, hydrogen mobility benefits from a mature industrial base and advanced e-mobility planning. Municipal interest is high, and ongoing pilots, including small-scale fleets and urban refuelling stations, have provided valuable lessons. Yet hydrogen adoption remains fragmented, and integration into broader urban mobility strategies is limited.

The roadmap envisions a phased deployment. In the **short** term (2025–2027), public procurement will play a key role in demonstrating hydrogen applications, targeting buses, waste collection vehicles, and logistics fleets. Complementary awareness campaigns will highlight the health and air-quality benefits of hydrogen, helping to build social acceptance. Cross-border demonstration projects with German and Swiss partners will ensure that early initiatives also support corridor connectivity.

In the **medium** term, from 2027 to 2030, these pilots will mature into urban hydrogen hubs that integrate refuelling infrastructure with EV charging stations and renewable supply. Regional industry participation in both vehicle production and station development will strengthen the local hydrogen ecosystem. Innovative operational measures, such as joint maintenance agreements and shared offtake contracts, will accelerate adoption and reduce investment risk.

In the **long** term, beyond 2030, the roadmap anticipates scaling from municipal pilots into regional corridors aligned with TEN-T networks. Public-private investment guarantees, and long-term contracts will secure financial viability, while cross-border cooperation ensures interoperability and pooled demand.

The **roadmap outlook** stresses that France should harness its strong innovation ecosystem to embed hydrogen within smart city planning and use regional corridors as a model for broader cross-border adoption.

To make this concrete,

- Municipal authorities can drive early demand by procuring hydrogen buses, waste collection fleets, and logistics vehicles, giving operators the confidence to invest in refuelling stations.
- Industry players and technology providers can collaborate with German and Swiss partners to set up joint demonstration projects, pooling resources and testing interoperability under real operational conditions.

5.3 Italy (PP4: FLA Lombardy, PP6: Turin Metropolitan City, PP9: Lombardy Region, PP12 Codognotto Italy)

Northern Italy, including Lombardy and Piedmont, hosts dense industrial and logistics hubs, creating strong potential for hydrogen mobility. Early initiatives such as the H2iseO rail project[12] and waste-to-hydrogen pilot facilities illustrate practical progress, though regulatory uncertainty, particularly around the "decreto tariffe," limits private investment and slows deployment.

The **short**-term focus (2025–2027) is on piloting hydrogen corridors and fleet-based operations through public-private partnerships. Fast-tracking regulatory clarity will unlock funding access, while workforce training and public awareness campaigns will build social acceptance and operational capacity. Early pilots will also test innovative integration with renewable energy, co-locating electrolysers at logistics hubs and industrial sites to optimise supply and reduce costs.

During the **medium** term (2027–2030), pilots will expand into hydrogen valleys linking production clusters with freight transport and industrial off-takers. Sector coupling, circular hydrogen production, and coordinated planning with regional energy and climate strategies will reinforce economic and environmental benefits. Operational measures include standardised refuelling protocols, digital management platforms, and collaborative agreements among fleet operators, producers, and municipalities.

Looking to the **long** term (2030+), Italy aims to scale cross-border hydrogen corridors connecting Switzerland, Austria, and France, embedding hydrogen into both transport and energy systems. By coupling infrastructure investment with social and workforce development, Italy can move from demonstration projects to robust, scalable ecosystems.

The **roadmap outlook** emphasises that Italy's ability to scale hydrogen mobility depends on achieving regulatory clarity and aligning financing tools with concrete deployment needs.

[12] https://www.trenord.it/en/about-us/the-mobility-revolution/the-novelty-of-the-hydrogen/

To accelerate progress,

- Regional authorities and businesses can form public–private partnerships around pilot corridors such as the H2iseO rail line and hydrogen-powered logistics depots, creating bankable projects that attract green investment.
- At the same time, industry associations and local governments can actively advocate for clear tariff frameworks and streamlined permitting, ensuring that private investors are not discouraged by regulatory uncertainty.

5.4 Austria (PP8: 4ward Energy / Reiterer & Scherling, PP12 Codognotto Italy)

Austria has strong technical expertise and active pilot projects, particularly in freight mobility along the Brenner and Tauern corridors. Despite these strengths, deployment remains fragmented, and hydrogen mobility applications are still emerging. Ongoing initiatives include the Austrian Hydrogen Valleys supported by WIVA P&G[13], which demonstrate collaborative models for hydrogen use in logistics, and the inGRID programme[14], which outlines expansion stages of the Austrian hydrogen network. In parallel, shared hydrogen hubs for logistics operators and cross-border frameworks with Bavarian and Lombardy partners are being developed to harmonise regulations and infrastructure planning.

In the **short** term (2025–2027), Austria's focus is on consolidating these pilots into operational hubs, using public-private partnerships to connect producers with anchor fleets. Coordination with cross-border stakeholders will ensure interoperability, while digital tools for logistics and refuelling management will enhance operational efficiency.

From 2027 to 2030 (**mid**-term), these hubs will expand to integrate green hydrogen into multimodal freight facilities, promoting standardised refuelling protocols and long-term procurement schemes. Operational measures include shared maintenance services, centralised supply contracts, and pilot-based risk-sharing among fleet operators.

Looking beyond 2030 (**long** term), Austria aims to position itself as a central Alpine connector, scaling infrastructure along north-south and east-west corridors and embedding hydrogen in national decarbonisation strategies.

The **roadmap outlook** highlights Austria's strength in corridor connectivity, where strategic deployment along the Brenner and Tauern routes can position the country as a backbone of Alpine hydrogen mobility.

[13] https://www.wiva.at/activities/?lang=en/#projekte
[14] https://ingrid.aggm.at/

To make this vision operational,

- Logistics operators and infrastructure developers can collaborate on shared hydrogen hubs at key freight nodes, ensuring that investments are anchored in real transport flows.
- At the same time, regional authorities and SMEs can experiment with digital platforms for joint fleet management, allowing smaller operators to coordinate their hydrogen use, pool demand, and reduce operational risks.

By combining corridor-based planning with collaborative digital tools, Austria can transform its technical expertise into scalable, real-world hydrogen infrastructure.

5.5 Germany (PP7: Climate Partner Upper Rhine Valley, PP11: Italian-German Chamber of Commerce)

Southern Germany is home to advanced hydrogen pilots, including Freiburg's waste-collection fleet, which integrates solar-powered electrolysis with on-site refuelling. Despite this progress, gaps remain in long-haul transport infrastructure and regulatory consistency across states and municipalities.

The **short**-term strategy (2025–2027) focuses on expanding municipal pilots into regional hydrogen hubs, while employing chambers of commerce to promote SME adoption through fleet-based models. Early investments will prioritise HRS coverage along Upper Rhine logistics routes, integrating cross-border coordination with Alsace, Switzerland, and Austria.

From 2027 to 2030, hydrogen mobility will be embedded within industrial clusters and freight corridors, supported by interoperable infrastructure and harmonised standards. Operational measures include centralised digital platforms for route optimisation, emissions tracking, and predictive maintenance, as well as blended finance and PPP agreements to reduce investment risk.

In the **long** term (2030+), Germany envisions fully operational cross-border corridors, linking France, Switzerland, and northern Italy, while integrating hydrogen mobility into the broader industrial hydrogen economy.

The **roadmap outlook** underscores that the long-term success of hydrogen mobility in Southern Germany depends on developing cross-sectoral synergies and scaling pilot projects into fully operational corridor infrastructure. In particular,

- Stronger collaboration between actors in the hydrogen value chain and mobility actors could enhance infrastructure planning and more effectively use available financing opportunities.

- Simultaneously, collaboration with Alsace and Switzerland on corridor-based investment strategies can align municipal, industrial, and cross-border fleet demand, pooling resources to strengthen the business case and ensure reliable infrastructure. By linking local adoption with transnational coordination, Germany can transform pilot initiatives into sustainable hydrogen mobility networks.

5.6 Common recommendations across partnership areas

Across the Alpine partnership areas, the roadmaps reveal both strong complementarities and recurring challenges, offering clear guidance on how hydrogen actors can accelerate ecosystem development.

One of the first priorities is clarifying national and regional hydrogen **strategies**, ensuring that local objectives are aligned with transnational corridors and TEN-T networks. Corridor-specific working groups—such as those along the Brenner or Fréjus routes—can coordinate infrastructure rollout, fleet deployment, and regulatory alignment, preventing fragmentation and duplication of efforts.

Financing emerges as another critical enabler. Blended models combining public and private capital, investment guarantees, and green funding lines (Horizon Europe, CEF, InvestEU) can de-risk early projects and incentivise participation from producers, logistics operators, and municipalities. By pooling resources across borders and sectors, hydrogen actors can mobilise the scale necessary for robust corridor development.

Operational efficiency and **interoperability** are equally vital. Shared digital platforms for refuelling availability, predictive maintenance, route optimisation, and emissions tracking allow fleet operators to plan with confidence and support cross-border integration. Pilot corridors and anchor projects serve as demonstrators, especially in remote or less commercially attractive areas, where modular and retrofit-friendly refuelling systems can validate technical and operational feasibility.

Social acceptance and **workforce readiness** underpin all deployment efforts. Awareness campaigns highlighting environmental, health, and economic benefits help communities understand the value of hydrogen mobility, while modular training programs prepare technicians and operators to safely manage decentralised infrastructure. These “soft measures” complement physical rollout, ensuring that the ecosystem is both socially supported and operationally capable.

Finally, **integration with existing renewable energy and e-mobility infrastructures** maximises synergies, reduces costs, and strengthens the business case for hydrogen. By co-locating electrolysers with logistics hubs, using smart energy management, and applying lessons from electric mobility corridors, hydrogen actors can accelerate adoption while optimising investment efficiency.

ANNEX I – TEMPLATES OF MEMORANDUM OF UNDERSTANDING AND MEMORANDUM OF COOPERATION

Interreg Co-funded by the European Union
Alpine Space
H2MA

MEMORANDUM OF UNDERSTANDING

between the Project Partner **<Name and Number of the Project Partner>**

and the following organisation(s):

<Name of Signatory 1>

<Name of Signatory 2, 3,...>

The signatories expressing their shared interest in supporting the transnational roll-out of green hydrogen mobility infrastructure in the Alpine region, which is being accelerated by the project "Green Hydrogen Mobility for Alpine Region Transportation" (acronym: H2MA).
The signatories agree that the practical implementation of green hydrogen rollout in the Alpine regions is lagging behind the KPIs set out in the EU Hydrogen Strategy. Therefore, both parties agree to work closely together to enhance the roll-out in the regional areas and to support the achievement of the KPIs by 2030/2050.

The Parties aim to cooperate in following way:

- Share knowledge, strategies, and tools.
- Promote cross-border cooperation and governance.
- Strengthen the capacity of public authorities and stakeholders.
- Encourage green investment and financing
- Develop and pilot hydrogen mobility routes in the Alpine region

Cooperation under this MoU may include:

- Participating in the "Alpine Collaboration Framework"
- Stakeholder engagement and knowledge exchange
- Joint planning of hydrogen corridors.
- Implementation of pilot actions.
- Development of policy recommendations and funding strategies.

This MoU is not legally binding and does not create financial or legal obligations.

Place and Date: ..../..../.....

<signature and stamp of the Project Partner> Name and surname of the legal representative of the organization, her/his function name	<signature and stamp of Signatory 1> Name and surname of the legal representative of the organization, her/his function name	<signature and stamp of Signatory 2> Name and surname of the legal representative of the organization, her/his function name

The H2MA project is co-funded by the European Union through the Interreg Alpine Space programme

MEMORANDUM OF COOPERATION

between the Project Partner **<Name and Number of the Project Partner>**

and the following organisation

<Name of Signatory>

The signatories support the transnational roll-out of green hydrogen mobility infrastructure in the Alpine region, which is being accelerated by the project "Green Hydrogen Mobility for Alpine Region Transportation" (acronym: H2MA) and intend to adopt the solutions provided.

Solutions:

1. H2MA planning tool to cooperatively design transnational green H2 mobility supply and distribution networks across the Alpine space.
2. Green H2 Masterplan for Alpine Space which provides an overview of hydrogen route planning in the Alpine regions, aligning with existing EU regulations and initiatives. It incorporates feedback from peer reviews and stakeholders, offering recommendations for future planning.
3. Recommendations and updates for local, regional, and national hydrogen strategies.
4. <Further solutions>

<Solution 1/2/3 is/are> interesting to the signatories for the following reasons:
they help in our design decisions regarding <more detail> / they help in our scheduling/operation decisions <more detail> / they help in our counselling operations <more detail> / they are interesting to a set of stakeholders who we represent <more detail>

<The organization intends to use <Solution 1/2/3 > in its following activities:
planning of hydrogen infrastructur // Update of local, regional, or national hydrogen strategies // investment decisions // advising customers // legislation creation// verification. Furthermore, the signatories are willing to participate in the "Alpine Collaboration Framework".

Place and Date

<signature and stamp of the Project Partner> Name and surname of the legal representative of the organization, her/his function name	<signature and stamp of Signatory> Name and surname of the legal representative of the organization, her/his function name

ANNEX II – SIGNED MEMORANDA

- **Memoranda of Understanding**
  - Xy
  - Xy
- **Memoranda of Cooperation**
  - Xy
  - xy

Pripombe dodal [RP1]: The signed Memoranda will be attached to the final version.